

FOR PUBLICATION
UNITED STATES COURT OF APPEALS
FOR THE NINTH CIRCUIT

MAX CLAUSEN, dba Clausen
Oysters; LILLI CLAUSEN, dba
Clausen Oysters,
Plaintiffs-Appellees,

v.

M/V NEW CARISSA, its engines,
apparel, electronics, tackle,
furniture, boats, appurtenances, etc
of Panamania flag in rem;
TAIHEIYO KAIUN CO. LTD., a
Japanese corporation in personam;
GREEN ATLAS SHIPPING SA, a
Panamanian corporation in
personam; TMM Co. LTD., a
Japanese corporation in personam,
Defendants-Appellants.

No. 01-35928
D.C. No.
CV-00-06078-TC

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No. 01-36079
D.C. No.
CV-00-06078-TC
OPINION

Appeal from the United States District Court
for the District of Oregon
Thomas M. Coffin, Magistrate Judge, Presiding

Argued and Submitted
March 4, 2003—Portland, Oregon

Filed August 12, 2003

Before: Diarmuid F. O'Scannlain, Ferdinand F. Fernandez,
and Raymond C. Fisher, Circuit Judges.

Opinion by Judge O'Scannlain

COUNSEL

Todd A. Zilbert, Wood Tatum Sanders & Murphy, Portland, Oregon, argued the cause and filed briefs for the appellants. Robert I. Sanders and Craig C. Murphy were on the briefs.

James P. Walsh and Eric L. Dahlin, Davis Wright Tremaine LLP, San Francisco, California, argued the cause and filed a brief for the appellees.

OPINION

O'SCANNLAIN, Circuit Judge:

“Bitter tears were shed over the slaughter
of the oyster, but as usual,
crying didn't help.”*

In this case, involving the destruction of oyster beds which allegedly occurred as a result of an oil spill on the Oregon

*Eleanor Clark, *The Oysters of Locmariaquer* 50 (Harper Perennial ed. 1992).

coast, we must determine the admissibility of expert testimony on the issue of causation.

I

Our story begins on February 3, 1999, when the M/V New Carissa, a Panama-registered and Japanese-owned freighter carrying 400,000 gallons of bunker and diesel fuel, bound for Coos Bay, Oregon, to pick up a load of wood chips, anchored two miles off the Coos Bay North Spit because the bar was too rough to cross. The next day, the ship's anchor began to drag, and while its crew attempted to raise the anchor and move the ship to deeper water, rough weather pushed the ship toward shore, and it ran aground. The Coast Guard airlifted the twenty-three crew members and a bar pilot from the ship the next day. The vessel began to leak oil as pounding waves widened cracks in its hull. With an approaching storm threatening to tear the ship asunder with seventy mile-per-hour winds, federal and state authorities responding to the crisis feared an environmental catastrophe. They decided to try a maneuver never previously attempted in the contiguous forty-eight states—to burn the vessel and its fuel, rather than risk trying to bring the ship out intact. On February 12, using plastic explosives and napalm, United States Navy and Coast Guard demolition crews detonated an explosion that cracked the fuel tanks and ignited the fuel oil as it spilled into cargo holds. The daring attempt worked, the fire consumed approximately 200,000 gallons of the ship's fuel and the blast ripped the ship into two pieces, which listed about 100 feet apart in the sea.

While a major environmental disaster was averted, the ship nonetheless spilled 70,000 gallons of oil, and oil from the New Carissa was soon detected inside Coos Bay. In addition to being a wood products port, Coos Bay, with its cool waters that reduce the risk of disease and sloughs that provide ample space for growing, is the richest oyster growing area in Oregon. Oyster farming plays a major part in the economic life

of Oregon's south coast, and at the time of the spill, the four largest oyster farms had approximately \$10 million worth of young oysters seeded in Coos Bay. Sure enough, oil was soon detected in the oyster beds themselves, prompting the Oregon Department of Agriculture to close Coos Bay's commercial oyster farms. Within weeks, approximately 3.5 million oysters died. A subsequent report prepared by federal and state agencies responding to the spill concluded that oil from the New Carissa was present in the tissues of every Coos Bay oyster that had been tested.

The plaintiffs in this action are Max and Lilli Clausen, owners and operators of Clausen Oysters, a commercial oyster farm located in Coos Bay. The Clausens brought suit against the New Carissa and its corporate owners and operators in federal district court, alleging claims under the Federal Oil Pollution Act, 33 U.S.C. § 2701, and the Oregon Oil Spill Act, Or. Rev. Stat. § 468B.300.¹ Under the Oregon Spill Act and the Federal Oil Pollution Act, parties responsible for oil spills are strictly liable without regard to fault for damages caused by the spill, subject to certain exceptions not at issue here. *See* 33 U.S.C. § 2702(a) (“[E]ach responsible party for a vessel . . . from which oil is discharged . . . is liable for the . . . damages . . . that result from such incident.”); Or. Rev. Stat. § 468B.310(1) (“Any person owning oil or having control over oil which enters the waters of this state . . . shall be strictly liable, without regard to fault, for the damages to persons or property, public or private, caused by such entry.”). Thus, the only disputed issue in this litigation was the cause of the 3.5 million oyster deaths, and the jury was ultimately presented with a murder mystery worthy of Hercule Poirot himself: who, or what, killed the oysters?

¹The Clausens' also charged the ship owners with negligence, but that claim was struck prior to trial.

A

The case quickly boiled down to a classic battle of the experts, involving two heavyweights in the field of shellfish disease. In presenting their case, the Clausens relied on Dr. Ralph Elston, a distinguished marine biologist with considerable expertise in the field of aquatic toxicology and the study and diagnosis of shellfish disease. He laid the blame for the oyster deaths squarely at the feet of the ship owners, his theory being that the oysters had died as a result of coming into contact with New Carissa oil particulates, which caused lesions in the gills of the shellfish, leading to bacterial infection, ultimately resulting in their deaths.

The ship owners relied on a similarly renowned and well credentialed expert in this field, Dr. Jerry Neff. Dr. Neff testified that the oysters did not die due to their contact with oil. According to Dr. Neff, the villain of the piece was mother nature—the oysters were killed by low salinity levels (salt per thousand parts of water) in Coos Bay, which was caused by heavy rainfall leading to increased freshwater streamflow into the estuary. Dr. Neff rejected Dr. Elston's theory of contact toxicity because, at relatively low levels of oil exposure, where there was no bioaccumulation of petroleum hydrocarbons in the tissues of the oysters, the theory had no support in the scientific literature.

While the experts in this case would reach differing conclusions with respect to the ultimate cause of the oyster deaths, the area of agreement between Drs. Neff and Elston was nevertheless quite large. Both experts agreed that the deaths were caused by bacterial infection, and both agreed the infection was a direct result of gill lesions the oysters had developed. Both experts agreed that the possible causes of the gill lesions were finite and identifiable, and in conducting their diagnostic evaluations, both identified six possible suspects: (1) infectious disease; (2) freezing trauma; (3) acute toxic effects of non-oil contaminants; (4) acute toxic effects of oil; (5) low

salinity; and (6) low-level toxic effects of oil. As they gathered and evaluated the available data, both of the experts ruled out suspects one through four as the ultimate cause of the oyster deaths.

1

Dr. Neff ultimately pointed to suspect number five, low salinity. He explained at trial that the natural environment for oysters is the ocean, where salinity levels are approximately 34-35 parts per thousand (ppt). The ocean is no good for farming however, since the oysters' natural predators—oyster drills, rock shells, whelks, starfish, and the like—would ravage the beds. Hence, farming takes place for the most part in estuaries like Coos Bay that experience influxes of ocean water through tidal action as well as fresh water from rivers and streams flowing into the bay. The idea is to plant the oyster beds where the salinity level is such that the oysters are safe from their natural predators, but the oysters will nonetheless thrive.

According to Dr. Neff, oysters do quite well in water that has a salinity level of 20 ppt or above. At lower than 20 ppt, oysters will become slightly stressed and their filtration rate—their ability to pump water and feed through the gills—decreases. At 13 ppt or lower, severe stress occurs, and at prolonged exposure to salinity levels at 8 ppt or below, oysters will die. Dr. Neff further explained that oysters can tolerate low salinity levels for extended periods of time. When salinity levels fall below safe levels, oysters will clam up—pun intended—and cease to feed and to filter water. This way, the oyster protects itself from dangerously low salinity levels, but the disadvantage is that it deprives its tissues of needed oxygen, and eventually it will use up its natural resources and die. When so-called anaerobic low-salinity mortality occurs, the oyster's tissue putrifies, and the oyster emits a rotting odor. Additionally, the tissue, depleted of oxygen, turns acidic, resulting in an etching on the inside of the shell.

The oysters at the Clausen farm did not present the strong odor or the etching that are the salient characteristics of anaerobic low salinity mortality. Rather, Dr. Neff's theory was that the oysters were exposed to low salinity, "not sufficiently low to cause this anaerobic response, but sufficiently low to stress the oysters and over a long period of time to cause the histopathological lesions in the gills that Dr. Elston reports."

2

Dr. Elston, on the other hand, pointed to suspect number six—low-level toxic effects of oil—as the most likely culprit. He explained that oysters, like all shellfish, are filter feeders. Because there are lots of particles in water not suitable as food, oysters have developed an elaborate system for sorting useful material from debris and other particles which are not nutritious or which might be toxic. When the concentration of a toxicant like oil becomes sufficiently large, the oil overwhelms the oyster's feeding mechanism, resulting in death, essentially by its choking on the oil. He further explained that the concentration of oil found in the water at Coos Bay was not sufficiently great to result in the acute toxic effect of oil described above. Rather, Dr. Elston's theory was that, while there were insufficient quantities of oil to overwhelm the oysters, the contact with the oil in the water caused the oysters to develop gill lesions, which in turn led to the bacterial infections that would ultimately cause their deaths. In other words, the oysters were able successfully to weed out the oil particulates, preventing ingestion, but that contact *itself* caused the lesions which in turn led to their deaths.

B

It is worth noting that *both* experts ruled in so-called contact toxicity—low-level toxic effects of oil—as a possible cause of the oyster mortalities in this case. In deciding to include contact toxicity in the lineup of suspects, Dr. Elston relied on a number of factors. First, there was the geographic

and temporal proximity between the spill and the 3.5 million deaths. He also relied on his own field studies of the oyster beds, as well as his histopathological examinations of several Coos Bay oysters. He further testified that he relied on government reports summarizing data collected during the response to the oil spill, which concluded that New Carissa oil had circulated within Coos Bay, and that every oyster tested during that time was found to have come into contact with New Carissa oil. While he acknowledged that the literature on the subject of contact toxicity was sparse, he explained that this was mostly due to the limited opportunities for such study. He rejected Dr. Neff's assertion that contact toxicity was wholly without support in the literature, and pointed to a paper written by Dr. Neff himself which concluded that "petroleum hydrocarbons, and particularly the more toxic aromatics and heterocyclics, accumulated by marine animals interact with cells and tissues to produce a variety of lesions." He also relied on the fact that contact toxicity was, *generally* speaking, well established in scientific literature, and while the literature specific to shellfish was sparse, "we certainly know that contact toxicity is a mechanism that occurs in virtually every animal system in which it's been studied."

Dr. Elston disagreed with Dr. Neff's ultimate conclusion that low salinity levels were the cause of the oyster deaths, and articulated several reasons for doing so. He found it significant that the oysters did not exhibit the characteristics associated with anaerobic low salinity mortality. He also based his decision to rule out low salinity as the cause of death on historic rainfall data, which indicated that the Clausen's oyster farm had been exposed to higher rainfall totals, and hence lower salinity levels, in prior years without experiencing significant fatalities. Dr. Elston also noted that the data Dr. Neff relied on was insufficient to establish actual salinity levels during the relevant times. He explained that saltwater concentrations change along with the ebb and flow of the tide, and that an oyster can endure long periods of low salinity by "shutting down," and by periodically opening back

up to feed and filter whenever the tides raised salinity levels to acceptable levels, thereby reestablishing its equilibrium. He explained that in order to gather accurate data on salinity levels, one would have to take salinity readings approximately every fifteen minutes. The data Dr. Neff relied on was collected several times *per month*, and therefore, in Dr. Elston's opinion, it was inadequate. Consequently, he ruled out low salinity as the cause of the oyster deaths, and by process of elimination, came to the conclusion that low level toxic effects of oil were to blame. As he testified at trial: "If we take the New Carissa oil exposure out of the equation, there is no other explanation for the oyster mortality."

C

Prior to trial, the ship owners moved in limine to exclude Dr. Elston's proffered testimony on the basis that it failed to pass muster under the Supreme Court's decision in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993). Because causation was the only disputed issue for trial, and because the Clausen's case rested on Dr. Elston's testimony, the ship owners also asked the trial court for summary judgment. After conducting an evidentiary hearing, the magistrate judge denied the motion to exclude Dr. Elston's testimony and the motion for summary judgment. The case proceeded to trial,² whereupon Drs. Elston and Neff presented their competing theories of the case to the jury. The jury believed Dr. Elston, and returned a jury verdict in favor of the Clausens for approximately \$1.4 million. The ship owners subsequently filed a motion for judgment as a matter of law, once again arguing that Dr. Elston should not have been permitted to testify on the basis of *Daubert*. The trial court denied that motion. *See Clausen v. M/V New Carissa*, 156 F. Supp. 2d 1192 (D. Or. 2001). The Clausens then asked the trial court

²With the consent of the parties, Magistrate Judge Coffin presided at trial. *See* 28 U.S.C. § 636(c)(1). We have jurisdiction pursuant to 28 U.S.C. §§ 636(c)(3) and 1291.

to award them their reasonable attorney fees and costs—including expert witness fees—pursuant to the Oregon Oil Spill Act, Or. Rev. Stat. §§ 468B.310(1), 300(6). The trial court granted the motion, and awarded the Clausens attorney fees in the amount of \$651,382.30, and expenses, including expert witness fees, in the amount of \$149,170.05. *See* 171 F. Supp. 2d 1138 (D. Or. 2001). The ship owners timely appeal.

II

We review the district court's decision to admit Dr. Elston's testimony for an abuse of discretion. *See Metabolife Int'l., Inc. v. Wornick*, 264 F.3d 832, 839 (9th Cir. 2001). We may only reverse the district court if we are left with a definite and firm conviction that the district court committed a clear error of judgment in admitting that testimony. *See SEC v. Coldicutt*, 258 F.3d 939, 941 (9th Cir. 2001).

A

[1] Federal Rule of Evidence 702 governs the admissibility of scientific evidence in federal district court.³ In *Daubert*, the Supreme Court charged district courts with the responsibility of ensuring that proffered scientific evidence is both relevant and reliable. *See* 509 U.S. at 589-95. Scientific evidence is deemed reliable if the principles and methodology used by an expert are grounded in the methods of science. *Id.* at 592-95; *Domingo v. T.K.*, 289 F.3d 600, 605 (9th Cir. 2002). In *Daubert* the Supreme Court set forth a non-exclusive list of fac-

³Rule 702 provides,

If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case.

tors to determine whether scientific testimony is sufficiently reliable: (1) whether the scientific theory or technique can be tested; (2) whether the theory or technique has been subjected to peer review and publication; (3) whether there is a known or potential error rate; and (4) whether the theory or technique is generally accepted in the scientific community. *Daubert*, 509 U.S. at 593-95.

[2] In determining whether a proffer of scientific evidence is sufficiently reliable, we have previously held that “[o]ne very significant fact to be considered is whether the experts are proposing to testify about matters growing naturally and directly out of research they have conducted independent of the litigation, or whether they have developed their opinions expressly for purposes of testifying.” *Daubert v. Merrell Dow Pharms, Inc.*, 43 F.3d 1311, 1317 (9th Cir. 1995) (“*Daubert II*”). If the testimony is not based on independent research then what is required is “proof that the research and analysis supporting the proffered conclusions have been subjected to normal scientific scrutiny through peer review and publication.” *Id.* at 1318.

B

We note at the outset that neither of *Daubert II*'s two primary criteria for establishing the reliability of expert testimony is met in this case. Dr. Elston's research was not “conducted independent of the litigation.” *Id.* at 1317. Rather, his opinion was developed “expressly for purposes of testifying.” *Id.* Nor was that research “subjected to normal scientific scrutiny through peer review and publication.” *Id.* at 1318. This does not mean, however, that his testimony was improperly admitted; a proffer of scientific testimony may still be deemed reliable enough to be admitted if neither of these two criteria is met. We recognized in *Daubert II* that “[t]here may well be good reasons why a scientific study has not been published. For example, it may be too recent or of insufficiently broad interest.” *Id.* at 1318 n.9. Where peer review and publi-

cation are absent, “the experts must explain precisely how they went about reaching their conclusions and point to some objective source—a learned treatise, the policy statement of a professional association, a published article in a reputable scientific journal or the like—to show that they have followed the scientific evidence method, as it is practiced by (at least) a recognized minority of scientists in their field.” *Id.* at 1319. The Clausens argue that this is exactly what happened here; Dr. Elston explained precisely how he went about reaching his conclusions as to the ultimate cause of the oysters’ gill lesions, and in reaching that conclusion, they argue, Dr. Elston followed a universally accepted method for establishing the root cause of the oyster deaths—differential diagnosis.

1

[3] A whole sub-body of *Daubert* law has developed with respect to the reliability, and admissibility, of differential diagnosis. Differential diagnosis is “the determination of which of two or more diseases with similar symptoms is the one from which the patient is suffering, by a systematic comparison and contrasting of the clinical findings.” *Stedman’s Medical Dictionary* 474 (26th ed. 1995) (hereinafter “*Stedman’s*”). As described by the Fourth Circuit,

Differential diagnosis, or differential etiology, is a standard scientific technique of identifying the cause of a medical problem by eliminating the likely causes until the most probable one is isolated. A reliable differential diagnosis typically, though not invariably, is performed after “physical examinations, the taking of medical histories, and the review of clinical tests, including laboratory tests,” and generally is accomplished by determining the possible causes for the patient’s symptoms and then eliminating each of these potential causes until reaching one

that cannot be ruled out or determining which of those that cannot be excluded is the most likely.⁴

Westberry v. Gislaved Gummi AB, 178 F.3d 257, 262 (4th Cir. 1999) (citation and internal quotation omitted).

[4] Differential diagnosis is a common scientific technique, and federal courts, generally speaking, have recognized that a properly conducted differential diagnosis is admissible under *Daubert*. See, e.g., *Westberry*, 178 F.3d at 262-66 (4th Cir. 1999); *Heller v. Shaw Indus., Inc.*, 167 F.3d 146, 154-55 (3d Cir. 1999); *Baker v. Dalkon Shield Claimants Trust*, 156 F.3d 248, 252-53 (1st Cir. 1998); *Zuchowicz v. United States*, 140 F.3d 381, 387 (2d Cir. 1998); *Ambrosini v. Labarraque*, 101 F.3d 129, 140-41 (D.C. Cir. 1996).

⁴Courts that have discussed differential diagnosis have come to use the term in ways that differ slightly from its dictionary definition, and from its usage in the medical community. See Federal Judicial Center, Reference Manual on Scientific Evidence 443 (2d ed. 2000) (hereinafter “Scientific Evidence”). Whereas most physicians use the term to describe the process of determining which of several *diseases* is causing a patient’s *symptoms*, see *id.*; Stedman’s at 474, courts have used the term in a more general sense to describe the process by which *causes* of the patient’s *condition* are identified. See e.g., *Westberry*, 178 F.3d at 262.

While some wag might surmise that the disjoint in usage is an unforeseen consequence of requiring us poor federal judges to grapple with scientific and medical concepts that oftentimes are beyond our ken, the discrepancy may be explained by reference to the fact that actual usage of the term in the medical community is quite varied. The term differential diagnosis is somewhat imprecise, and the dictionary definition notwithstanding, no universal definition of differential diagnosis exists and it is often used to mean different things. See Jerome P. Kassirer & Richard I. Kopelman, Learning Clinical Reasoning 112 (1991) (hereinafter “Clinical Reasoning”). For example, environmental and occupational health physicians use the term in the same way courts have, to describe the process of determining whether an environmental exposure caused the patient’s disease. See Scientific Evidence at 443 (citing Mark R. Cullen et al., *Clinical Approach and Establishing a Diagnosis of an Environmental Medical Disorder*, in *Environmental Medicine* 217, 220 (Stuart M. Brooks et al., eds., 1995)). Both of the experts in this case used the term in this more general sense, and lest we muddy the waters any further, we will do the same.

The first step in the diagnostic process is to compile a comprehensive list of hypotheses that might explain the set of salient clinical findings under consideration. *See* Clinical Reasoning, *supra* n.2, at 112. The issue at this point in the process is which of the competing causes are *generally* capable of causing the patient's symptoms or mortality. Expert testimony that rules in a potential cause that is *not* so capable is unreliable. *See* *Hall v. Baxter Healthcare Corp.*, 947 F. Supp. 2d 1387, 1413 (D. Or. 1996) (“[I]t is . . . important to recognize that a fundamental assumption underlying [differential diagnosis] is that the final, suspected ‘cause’ . . . must actually be capable of causing the injury.”). Similarly, expert testimony that neglects to consider a hypothesis that might explain the clinical findings under consideration may also be unreliable. Including even rare entities in the list “ensures that such disorders are not overlooked.” Clinical Reasoning, *supra* n.2, at 112; *see also* *Westberry*, 178 F.3d at 265 (“A differential diagnosis that fails to take serious account of other potential causes may be so lacking that it cannot provide a reliable basis for an opinion on causation.”).

[5] After the expert rules in all of the potential hypotheses that might explain a patient's symptoms, he or she must then engage in a process of elimination, eliminating hypotheses on the basis of a continuing examination of the evidence so as to reach a conclusion as to the most likely cause of the findings in that particular case. A district court is justified in excluding evidence if an expert “utterly fails . . . to offer an explanation for why the proffered alternative cause” was ruled out. *Cooper v. Smith & Nephew, Inc.*, 259 F.3d 194, 202 (4th Cir. 2001). The expert must provide reasons for rejecting alternative hypotheses “using scientific methods and procedures” and the elimination of those hypotheses must be founded on more than “subjective beliefs or unsupported speculation.” *Claar v. Burlington N. R.R. Co.*, 29 F.3d 499, 502 (9th Cir. 1994).

While we have not previously used the magic words “differential diagnosis,” we recognized in *Kennedy v. Collagen Corp.*, 161 F.3d 1226 (9th Cir. 1998), that a reliable differential diagnosis passes muster under *Daubert*. See *Westberry*, 178 F.3d at 263 (citing *Kennedy* for the proposition that the Ninth Circuit has held that “a medical opinion on causation based upon a reliable differential diagnosis is sufficiently valid to satisfy” Rule 702); *Hollander v. Sandoz Pharms. Corp.*, 289 F.3d 1193, 1210-11 (10th Cir. 2002) (noting that *Kennedy* permitted the admission of a reliable differential diagnosis); see also Gary Sloboda, *Differential Diagnosis or Distortion?*, 35 U.S.F. L. Rev. 301, 315 (2001) (“Although the Ninth Circuit has never explicitly rejected or validated expert causation testimony based on a differential diagnosis, in *Kennedy* . . . it effectively recognized its use as a reliable methodology.”).

Kennedy involved a product liability action for injuries sustained by the plaintiff following injections of the defendant’s medical product, Zyderm. 161 F.3d at 1227. The plaintiff claimed that she developed “atypical systemic lupus erythematosus (SLE), a debilitating and incurable autoimmune disease, as a result of the Zyderm injections.” *Id.* The plaintiff sought to introduce the affidavit of an expert that established causation. *Id.* at 1228. In forming his opinion, the expert relied “upon a variety of objective, verifiable evidence,” including an examination of the plaintiff, the plaintiff’s medical history, her medical laboratory tests, and her medical reports. *Id.* The district court rejected the expert’s testimony because he had not relied on specific epidemiological or animal studies proving Zyderm causes SLE and because there existed no consensus in the medical community on the issue. *Id.*

We reversed the district court, and held that the proffered evidence was reliable, and therefore admissible, because it was “based on [the expert’s] knowledge of the connection between collagen and various autoimmune disorders, com-

bined with [the expert's] observation of [the plaintiff's] injuries and her medical history and laboratory tests." *Id.* at 1229-30. We noted that the lack of studies linking Zyderm and SLE was not fatal to its admissibility: "The fact that a cause-effect relationship between Zyderm and lupus in particular has not been conclusively established does not render [the expert's] testimony inadmissible." *Id.* at 1230. Accordingly, the district court "abused its discretion in excluding [the expert's] testimony." *Id.* at 1227.

3

The ship owners' primary argument on appeal is not that differential diagnosis is itself unreliable, but that Dr. Elston's particular use of the methodology was unreliable because he should never have ruled in low-level toxic effects of oil as a potential cause of the oyster mortality. The ship owners argue that the quantity of oil necessary to cause harm to gill feeding organisms has not been established with any degree of certainty, and therefore Dr. Elston's decision to include low-level toxic effects of oil as a possible cause of the mortality was mere guesswork on his part, unsupported by "scientific knowledge." The ship owners also point out that low-level toxic effects of oil have not been established as a potential cause of gill lesions in shellfish in the scholarly literature.

[6] Dr. Elston's testimony was not unsupported by "scientific knowledge." The principles and methodology he employed in conducting his research and reaching his conclusions were "ground[ed] in the methods and procedures of science." *Daubert*, 509 U.S. at 590. Dr. Elston's decision to rule in contact toxicity as a possible cause of the oyster mortality was based on a number of factors. He first conducted histopathological examinations in the lab, and concluded that the oysters had developed gill lesions, and those lesions were the ultimate cause of the oysters' death. His decision to rule in contact toxicity as a possible cause of death was based on a detailed history of the oyster site; the government reports con-

cluding that New Carissa oil entered into and circulated within the Coos Bay oyster farms; the fact that every oyster tested by the government was found to contain oil from the New Carissa; and the temporal and geographic proximity with the New Carissa oil spill. While the mere fact that two events correspond in time and space does not *necessarily* mean they are causally related, “a temporal relationship between exposure to a substance and the onset of a disease . . . can provide compelling evidence of causation.” *Westberry*, 178 F.3d at 265; *Heller*, 167 F.3d at 154; *Zuchowicz*, 140 F.3d at 385, 390. Indeed, the geographic and temporal proximity between the spill and the onset of the gill lesions led the ship owners’ own expert, Dr. Neff, to rule in contact toxicity as a possible cause of the oyster deaths. Dr. Elston’s decision to rule in contact toxicity is based “upon a variety of objective, verifiable evidence,” *Kennedy*, 161 F.3d at 1228, and compares favorably to the quantum and quality of evidence found sufficient in *Kennedy*.

[7] The fact that the minimum threshold level of oil necessary to cause harm to shellfish has not yet been established with any degree of certainty does not render Dr. Elston’s evaluation mere guesswork, as the shipowners argue. While “precise information concerning the exposure necessary to cause specific harm [is] beneficial, such evidence is not always available, or necessary, to demonstrate that a substance is toxic . . . and need not invariably provide the basis for an expert’s opinion on causation.” *Westberry*, 178 F.3d at 264; *Heller*, 167 F.3d at 157 (“even absent hard evidence of the level of exposure to the chemical in question, a medical expert could offer an opinion that the chemical caused plaintiff’s illness”).

[8] In addition, while the case for contact toxicity has not been *specifically* established in the relevant scholarly literature, it is nonetheless not wholly without support in such publications. Contact toxicity is a mechanism that occurs in every animal system in which it has been studied, and the ship own-

ers' expert himself, Dr. Neff, wrote a paper which indicated that gill lesions can occur in shellfish when exposed to oil. Even were we to put Dr. Neff's paper aside, we have held that a lack of specific scholarly support does not prevent the admission of differential diagnosis testimony: "The fact that a cause-effect relationship . . . has not been conclusively established does not render [the expert's] testimony inadmissible." *Kennedy*, 161 F.3d at 1230. Furthermore, there are good reasons why there is a paucity of literature with respect to the particular scientific theory at issue here—the causal relationship between low level toxic effects of oil and shellfish disease. Oil spills, fortunately, are a rare enough occurrence, and the opportunities for scholarly research are few. In such a situation, a lack of published studies should not bar otherwise scientifically valid testimony. The Supreme Court itself has recognized that "[p]ublication . . . is not the *sine qua non* of admissibility; it does not necessarily correlate with reliability, and in some instances well-grounded but innovative theories will not have been published. Some propositions . . . are too particular, too new, or of too limited interest to be published." *Daubert*, 509 U.S. at 593 (citations omitted); *see also Daubert II*, 43 F.3d at 1318 n.9 ("There may well be good reasons why a scientific study has not been published. For example, it may be too recent or of insufficiently broad interest."); *Kennedy*, 161 F.3d at 1229 ("[I]t is scientifically permissible to reach a conclusion without [specific] studies.").

[9] The case law specific to differential diagnosis recognizes that the absence of peer-reviewed studies does not in itself prevent an expert from ruling in a diagnostic hypothesis that might explain the patient's symptoms. As the Eighth Circuit explained,

We do not believe that a medical expert must always cite published studies on general causation in order to reliably conclude that a particular object caused a particular illness. The first several victims of a new toxic tort should not be barred from having their day

in court simply because the medical literature, which will eventually show the connection between the victims' condition and the toxic substance, has not yet been completed. If a properly qualified medical expert performs a reliable differential diagnosis through which, to a reasonable degree of medical certainty, all other possible causes of the victims' condition can be eliminated, leaving only the toxic substance as the cause, a causation opinion based on that differential diagnosis should be admitted.

Turner v. Iowa Fire Equip. Co., 229 F.3d 1202, 1208-9 (8th Cir. 2000) (quotations and internal citations omitted); *see also Heller*, 167 F.3d at 155; *Hollander*, 289 F.3d at 1211-12; *Westberry*, 178 F.3d at 262 (reliable differential diagnosis alone may provide a valid foundation for a causation opinion, even when no epidemiological studies, or laboratory data are offered in support of the opinion).

[10] In short, contrary to the ship owners' argument, Dr. Elston could permissibly include low-level toxic effects of oil as a possible cause of the oyster mortality without supporting peer-reviewed literature specific to that subject, so long as he relied "upon a variety of objective, verifiable evidence." *Kennedy*, 161 F.3d at 1228. Dr. Elston did that here. The record indicates that he surveyed the oyster beds, conducted clinical examinations of the diseased and dead oysters, relied on reports from the government response teams showing that New Carissa oil was in the oyster beds, and in the oysters themselves, and on the fact that contact toxicity is a mechanism that occurs in every animal system studied thus far. Under the circumstances, we cannot say it was "junk science" for Dr. Elston to rule in contact toxicity as a possible cause of the oyster deaths.

Dr. Elston's reasons for reaching the conclusion, by process of elimination, that contact toxicity was the *specific* cause of

the oyster deaths were similarly reliable. Specifically, his decision to rule out low salinity levels—the culprit the ship owners point to—was based on Dr. Elston’s examination of data relating to historic rainfall patterns in the Coos Bay area, as well as finalized chemistry data from the government response team. He provided specific reasons for ruling out low salinity levels as the cause of the oyster deaths, including the fact that the oysters did not exhibit any of the characteristics associated with anaerobic low salinity mortality; that Coos Bay was previously exposed to higher rainfalls without significant oyster deaths; and that the salinity testing conducted by the government, and on which Dr. Neff relied, was too infrequent to provide for an accurate assessment of the actual salinity levels during the relevant time period. After eliminating low salinity levels as the ultimate cause of the oyster deaths, Dr. Elston was left to conclude that low level toxic effect of oil was the most probable explanation for the oyster deaths. As he explained, “if we take the New Carissa oil exposure out of the equation, there is no other explanation for the oyster mortality.” This is not a case, therefore, where the expert “utterly fails . . . to offer an explanation for why the proffered alternative cause” was ruled out, *Cooper*, 259 F.3d at 202, nor were Dr. Elston’s stated reasons for ruling out low salinity as the specific cause of the deaths based upon “subjective beliefs or unsupported speculation.” *Claar*, 29 F.3d at 502.

[11] Presented with the Clausen’s proffer of expert scientific testimony in this case, the trial judge engaged in a thorough preliminary assessment of whether the reasoning or methodology underlying Dr. Elston’s testimony was scientifically valid, as required by *Daubert*. 509 U.S. at 592-93. We conclude that trial judge’s conclusion that the proffered testimony was sufficiently reliable to go to the jury was not an abuse of discretion.

III

[12] Under the Oregon Oil Spill Act, persons “owning oil or having control over oil which enters the waters . . . [are]

strictly liable, without regard to fault, for the damages . . . caused by such entry.” Or. Rev. Stat. § 468B.310(1). Damages means “damages, costs, losses, penalties or attorney fees of any kind for which liability may exist under the laws of this state resulting from, arising out of or related to the discharge or threatened discharge of oil.” *Id.* § 468B.300(6). The trial court found that these provisions were “most appropriately viewed as including an extensive fee-shifting award that allows a prevailing plaintiff to recover attorney fees and litigation costs according to traditional principles of reasonableness.” 171 F. Supp. 2d at 1141. Accordingly, the district court awarded attorney fees and expenses, including expert witness fees, to the Clausens. *See id.* at 1138. We review that decision de novo. *See Kona Enters. v. Estate of Bishop*, 229 F.3d 877, 883 (9th Cir. 2000).

A

The ship owners argue that, contrary to the district court’s interpretation, the Spill Act does not contemplate an award of attorney fees in an action brought pursuant to the Act itself. Rather, they argue that the Spill Act provides only for those attorney fees incurred at some time *prior* to an action brought under the Act. They put forth three separate, but related, arguments in support of this interpretation.

First, the ship owners point out that the general rule in Oregon is that attorney’s fees are not considered damages when sought in the same action in which the services were rendered. However the cases they cite stand for a rather narrower proposition: “The general rule is that attorney fees are not recoverable *in a breach of contract action unless authorized by statute* or by the agreement.” *Raymond v. Feldmann*, 124 Or. App. 543, 546 (1993) (emphasis added). This is not a breach of contract action, and of course, the argument that there is a general rule against the recovery of attorney fees as damages begs the question whether that rule has been changed by statute in the instant case. The damages provi-

sions of the Spill Act are written in extremely broad terms, *see Portland Gen. Elec. Co. v. Bureau of Labor & Ind.*, 317 Or. 606, 610 (1993) (“[T]he text of the statutory provision itself is . . . the starting point for interpretation and is the best evidence of the legislature’s intent.”), defining damages as “damages, costs, losses, penalties *or attorney fees of any kind* for which liability may exist” *See* Or. Rev. Stat. § 468B.300(6) (emphasis added). This is no ordinary damages provision, and the plain language of the provision indicates that the Oregon legislature contemplated a broad potential recovery for losses incurred as a result of an oil spill.

Second, the ship owners argue that the district court’s interpretation of the damages provision fails to give effect to all of the words in the statute. They point out that if the provision is interpreted to include attorney fees incurred in the *same* action in which the services are rendered, the phrase “attorney fees of any kind for which liability may exist under the laws of this state” is rendered meaningless, and that such a result is contrary to the basic tenets of statutory construction. *See Tabor v. Ulloa*, 323 F.2d 823, 824 (9th Cir. 1963) (“a legislature is presumed to have used no superfluous words”).

The ship owners neglect to take account of the remaining language in the sentence on which they rely, however. Damages “include[] attorney fees of any kind for which liability may exist under the laws of this state *resulting from, arising out of or related to the discharge or threatened discharge of oil.*” Or. Rev. Stat. § 468B.300(6) (emphasis added). The liability must “result[] from . . . the discharge or threatened discharge of oil.” *id.*, and the only Oregon law governing liability for the discharge or threatened discharge of oil is the Spill Act itself. Thus, contrary to giving effect to all the language in the provision, the ship owners’ interpretation would have the effect of rendering the language relating to attorney fees a nullity, and the canon of construction on which the ship owners rely actually cuts *against* their argument.

While the damages provision in the Oregon Oil Spill Act is not exactly a model of clarity, we agree with the learned trial judge that the phrase “for which liability may exist under the laws of this state” refers to the fact that attorney fees “can only be charged to the purported polluter upon a finding of liability under the Oregon Oil Spill Act or other Oregon statute. Once liability has been found, the polluter is responsible for damages and fees ‘of any kind,’ including fees incurred in a prior action, but hardly limited to only such fees.” 171 F. Supp. 2d at 1140 n.3. Contrary to the ship owners’ argument, this interpretation gives effect to all of the language in the provision, and makes sense in light of the non-traditional definition of damages in the Spill Act.

Finally, the ship owners point out that the Oregon legislature has shifted fees in other statutes, and they did so in clear and explicit terms. *See, e.g.* Or. Rev. Stat. § 646.638(3) (unlawful trade practices act); *id.* § 742.061(1) (insurance disputes); *id.* § 20.080(1) (minor tort claims). Construing the damages provision here to provide for fee-shifting makes no sense in light of these examples, they argue. But the Oregon legislature is hardly limited to a single method of providing for attorney fees. While we accept the proposition that attorney fees are not *traditionally* included as “damages,” the ship owners argument simply fails to take account of the non-traditional definition of damages adopted by the Oregon legislature in *this* instance. To be sure, attorney fees are not normally included as “damages,” but neither are “costs, losses, [or] penalties,” Or. Rev. Stat. § 468B.300(6), yet nonetheless the legislature saw fit to provide for the recovery of those items. It appears that the Oregon legislature, in its own somewhat idiosyncratic fashion, simply wanted to make whole those parties damaged by an oil spill.

[13] The legislative history, such as it is, supports our conclusion that the damages provisions of the Spill Act were intended to provide for an award of reasonable attorney fees to prevailing plaintiffs. *See Portland Gen. Elect. Co.*, 317 Or.

at 611-12 (“[I]f . . . the intent of the legislature is not clear from the text and context . . . the court will then . . . consider legislative history . . .”). The provision at issue here was enacted in 1991 as an amendment to the Spill Act. *See* H.B. 3348, 66th Leg., Reg. Sess. (Or. 1991). In the course of considering the proposed amendments, the Oregon House Committee on the Judiciary heard testimony from a representative of the Marine Spill Response Corporation (“MSRC”). *See Hearings on H.B. 3348 Before the House Comm. on the Judiciary*, 66th Leg., Reg. Sess., Exhibit A (April 15, 1991) (statement of Mr. Stephen Duca, Vice President, Readiness and External Affairs, Marine Spill Response Corp.). The MSRC is an oil industry task force formed after the Exxon Valdez oil spill whose task it is to build a national response organization to deal with oil spills. The MSRC urged the Oregon legislature to adopt a provision limiting liability for oil spill responders that mirrors the regime established by the Federal Oil Pollution Act of 1990. Significantly, the model provision proposed by the MSRC defines damages as “damages of any kind for which liability may exist under the laws of this state resulting from, arising out of or related to the discharge or threatened discharge of oil.” It says nothing about attorney fees, and the fact that the Oregon legislature adopted a definition of damages broader than the one urged by the MSRC supports our reading of the statute, and also helps to explain the unusual wording of the damages provision. The Oregon legislature appears simply to have slotted in the provision relating to “damages, costs, losses, penalties or attorney fees” before the “of any kind” language proposed by the MSRC.

[14] In short, we agree with the trial court that the Spill Act provides for an award of reasonable attorney fees to prevailing plaintiffs, and there was no error in the court’s decision to award such fees.

B

In addition to awarding attorney fees, the trial court also held that the language of the damages provision “costs . . . of

any kind” allowed for the recovery of reasonable expert witness fees to prevailing plaintiffs. *See* 171 F. Supp. 2d at 1144.

1

The shipowners contend that the district court erred in permitting the Clausens to recover expert witness fees under Oregon law, because the recovery of costs in federal court is governed by federal law. Whether state or federal law should apply in a diversity action is a *de novo* question of law. *Torre v. Brickey*, 278 F.3d 917, 919 (9th Cir. 2002).

Title 28 U.S.C. § 1920 provides that a federal court “may tax” specified items, including witness fees, as costs against the losing party, and § 1821(b) states that a witness “shall be paid” a fee of \$40 per day for court attendance. In *Aceves v. Allstate Ins. Co.*, 68 F.3d 1160 (9th Cir. 1995), the district court, sitting in diversity, awarded the prevailing party costs, including expert witness fees, under section 998(c) of the California Code of Civil Procedure. *Id.* at 1167. Presented, as we were in that case with a “choice of law issue . . . between state and federal expert witness cost provisions,” *id.* at 1168, we reasoned that the district court had erred in applying California law:

California law controls the substance of this lawsuit, but federal law controls the procedure by which the district court oversaw the litigation. *See Hanna v. Plumer*, 380 U.S. 460, 483, 14 L. Ed. 2d 8, 85 S. Ct. 1136 (1965). Because reimbursement of expert witness fees is an issue of trial procedure, federal law should have controlled this costs issue, unless one of two factors indicated otherwise. State procedure would only have applied if the pedigree of the federal rule could not be traced back to a federal statute or a Federal Rule of Civil Procedure, duly enacted pursuant to the Rules Enabling Act, *see id.* at 470-71, or if the federal rule created an incentive to shop

for the federal forum, *see id.* at 467-68. *See also Olympic Sports Prods., Inc. v. Universal Athletic Sales Co.*, 760 F.2d 910, 914-15 (9th Cir. 1985).

Id. at 1167-68.

Our holding that “federal law should control the reimbursement of expert witnesses in federal courts sitting in diversity jurisdiction”, *id.* at 1168, accorded with several other circuits to have considered the issue. *See, e.g., Chaparral Resources, Inc. v. Monsanto Co.*, 849 F.2d 1286, 1291-92 (10th Cir. 1988); *Kivi v. Nationwide Mut. Ins. Co.*, 695 F.2d 1285, 1289 (11th Cir. 1983); *Bosse v. Litton Unit Handling Sys.*, 646 F.2d 689, 695 (1st Cir. 1981).

We think there is a critical distinction between *Aceves* and the present case, however. In *Aceves*, the “choice of law issue [was] between state and federal *expert witness cost provisions*.” 68 F.3d at 1168 (emphasis added). In other words, we faced a choice between a state rule of procedure and a federal rule of procedure. *See id.* at 1167. (“reimbursement of expert witness fees is an issue of trial procedure”). In the present case, however, we are presented with a choice between a federal cost provision, and a state *damages provision* that permits prevailing plaintiffs under the Oil Spill Act to recover “costs of any kind” as *one element of its compensatory damages*. Once a prevailing plaintiff proves his case, he becomes entitled under the Oil Spill Act to recover damages, and those damages “include[] . . . costs . . . of any kind.” Or. Rev. Stat. § 468B.300(6) (emphasis).

[15] The question is whether the right to damages which accrues to prevailing plaintiffs under the Oil Spill Act is substantive in nature. If it is, then it cannot be trumped by § 1821(c), for it is long since settled that “federal courts sitting in diversity apply state substantive law and federal procedural law.” *Feldman v. Allstate Ins. Co.*, 322 F.3d 660, 666 (9th Cir. 2003) (citing *Erie RR Co. v. Tompkins*, 304 U.S. 64

(1938)). We think that such a right is substantive, for “the question of the proper measure of damages is inseparably connected with the right of action,” *Chesapeake & Ohio Railway Co. v. Kelly*, 241 U.S. 485, 491 (1916), and numerous cases have held as much. *See, e.g. Browning-Ferris Indus. v. Kelco Disposal, Inc.*, 492 U.S. 257, 278 (1989) (“In a diversity action, or in any other lawsuit where state law provides the basis of decision, the propriety of an award of . . . damages for the conduct in question . . . [is a] question[] of state law.”); *Barbier v. Shearson Lehman Hutton Inc.*, 948 F.2d 117, 122 (2d Cir. 1991) (“the measure of damages is a matter of state substantive law”); *Carota v. Johns Manville Corp.*, 893 F.2d 448, 450 (1st Cir. 1990) (“The law of damages . . . is substantive since it prescribes what, if any, money a plaintiff will receive as compensation for injury. Damages are an element of plaintiff’s case.”) (internal quotation marks omitted); *In re Air Crash Disaster Near Chicago, Ill.*, 701 F.2d 1189, 1194 (7th Cir. 1983) (“[T]he state’s view of the measure of damages, which is inseparable from the substantive right of action, . . . binds a federal court sitting in diversity.”); *cf. Garcia & Maggini Co. v. Washington Dehydrated Food Co.*, 294 F. 765, 767 (9th Cir. 1924) (holding in conflict of laws analysis that it was “proper to apply the law of the state of Washington as to the measure of damages which involved the substantive rights of the parties”).

[16] Our holding today, that the Oregon Oil Spill Act’s measure of damages provision trumps § 1821(b) under *Erie* and its progeny is in accord with several other circuit court decisions. In *Henning v. Lake Charles Harbor and Terminal District*, 387 F.2d 264 (5th Cir. 1968), the trial court awarded expert costs under Louisiana law in an eminent domain case, and the Fifth Circuit affirmed, holding that the “reimbursement . . . is a substantive requirement of Louisiana law, a substantive right of the [plaintiffs], and binding upon this Court.” *Id.* at 267. The Fifth Circuit later explained that the *Henning* rule applied in only limited circumstances, and that “absent an express indication from the Louisiana legislature, or its courts,

of Louisiana's special interest in providing litigants with recovery of expert witness fees in a personal injury action, federal law controls the award of such fees as costs." *Chevalier v. Reliance Ins. Co. of Ill.*, 953 F.2d 877, 886 (5th Cir. 1992); *see also Freeman v. Package Machinery Co.*, 865 F.2d 1331, 1347-48 (1st Cir. 1988) (Massachusetts cost-shifting provision "constitutes part of the substantive remedy created by state law" and as such, trumps § 1821 under *Erie*); *Bright v. Land O'Lakes, Inc.*, 844 F.2d 436, 443-44 (7th Cir. 1988) (while "the general rule . . . is that the prevailing party can only recover amounts prescribed in § 1821," because the Wisconsin Fair Dealership Law authorized "fee shifting of actual costs to a prevailing plaintiff," then Wisconsin law applies).

As was the case in *Henning*, we are here presented with an "express indication" of a state legislature's "special interest in providing litigants" with full compensation for reasonable sums expended in pursuit of an Oil Spill Act claim. *Chevalier*, 953 F.2d at 886. Because "the measure of damages is a matter of state substantive law," *Barbier*, 948 F.2d at 122, it would do violence to the principles enunciated in *Erie* to disregard Oregon law in favor of § 1821(b). *See Erie*, 304 U.S. at 78 ("Congress has no power to declare substantive rules of common law applicable in a State . . ."); *see also Barbier*, 948 F.2d at 1348 ("It would turn things topsy-turvy to saddle [Oil Spill Act] claimants—no matter how galling their deprivations or how vindictory the outcome of their suits—with whopping fees for the services of expert witnesses.").

[17] The trial court did not err in its application of Oregon law.

The ship owners second argument with respect to the district court's award of costs is based on the Supreme Court's decision in *West Virginia University Hospitals v. Casey*, 499 U.S. 83 (1991). The question presented in that case was

whether expert fees in civil rights litigation may be shifted to the losing party pursuant to 41 U.S.C. § 1988, which permits the award of “a reasonable attorney’s fee.” The Court found that where Congress had intended to provide for the recovery of expert fees, it specifically provided for such recovery. *See, e.g.*, 15 U.S.C. §§ 2618(d), 2619(c) (Toxic Substances Control Act); 15 U.S.C. §§ 2060(c), 2072(a) (Consumer Product Safety Act); 42 U.S.C. § 6972(e) (Resource Conservation and Recovery Act of 1976). This record of statutory usage, the Court reasoned, demonstrated that attorney fees and expert fees are separate elements of litigation costs. *See* 499 U.S. at 88. Therefore, the Court concluded, § 1988’s provision for a “reasonable attorney’s fee” did not allow for the recovery of expert witness fees.

Casey is not on point. The district court did not permit the Clausens to recover expert fees pursuant to the provision in the Spill Act for “attorney fees,” but rather because the Spill Act allows for the recovery of “costs . . . of any kind.” (emphasis added). There is no such equivalent language in the federal statutes discussed in *Casey*. As the district court noted, “[t]he [Oregon] legislature did not authorize merely the shifting of attorney fees to the losing party, as in *Casey*; rather, its intent was clearly to allow a prevailing plaintiff to be made whole. This is the only rational explanation behind including fees, costs, losses, etc. as damages. When expert witness fees are reasonable in pursuing a claim under the OSA, the act would appear to include them as recoverable damages.” 171 F. Supp. 2d at 1144. We agree.

AFFIRMED.